

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 19

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JAMES R. KAHN, HAROLD R. KAUFMAN,
VIACHESLAV V. ZHURIN, DAVID A. BALDWIN
and TODD L. HYLTON

Appeal No. 2002-1148
Application 09/471,662

ON BRIEF

Before KIMLIN, PAK and OWENS, *Administrative Patent Judges*.

OWENS, *Administrative Patent Judge*.

DECISION ON APPEAL

This appeal is from the final rejection of claims 1-8, which are all of the claims in the application.

THE INVENTION

The appellants claim a sputtering apparatus and method.

Claim 1, directed toward the apparatus, is illustrative:

1. A sputtering apparatus for use in an evacuated volume comprising:

ion source means, with means for introducing a gas, ionizable to produce a plasma having a sheath, into said ion source means, and with the ions leaving said ion source means in the form of an ion efflux having an energy of about 50 eV or less;

a sputter target, biased negative relative to ground, with said sputter target disposed in the ion efflux of said ion source means, whereby particles of material are sputtered from said target;

a deposition substrate upon which the material sputtered from said sputter target is deposited;

a wherein said ionizable gas within said evacuated volume is at a first pressure and said ionizable gas within said ion source is at a second pressure, and wherein said first pressure is substantially less than said second pressure.

THE REFERENCES

References relied upon by the examiner

King	4,108,751	Aug. 22, 1978
Ceasar et al. (Ceasar)	4,376,688	Mar. 15, 1983
Quazi	4,693,805	Sep. 15, 1987
Arnold et al. (Arnold)	5,423,971	Jun. 13, 1995

"Ion Beam Neutralization", *CSC Technical Note* 4, 5, 11
(undated).¹

¹ There is no dispute as to whether Ion Beam Neutralization is prior art. Consequently, we consider this reference to be

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References relied upon by the appellants

Kaufman 3,156,090 Nov. 10, 1964
James M.E. Harper, "Ion Beam Deposition", in *Thin Film Processes*
175-206 (John L. Vossen and Werner Kern eds., Academic Press
1978).

THE REJECTIONS

The claims stand rejected under 35 U.S.C. § 103 as follows:
claims 1, 5 and 8 over Ceasar in view of King; claim 2 over
Ceasar in view of King and Quazi; claims 3 and 4 over Ceasar in
view of King and Arnold; claim 3 over Ceasar in view of King,
Quazi and Arnold; and claims 6 and 7 over Ceasar in view of King,
Quazi and Ion Beam Neutralization.

OPINION

We affirm the rejections of claims 1-7 and reverse the
rejection of claim 8.

Claims 1-7

Among apparatus claims 1-7, claim 1 is the sole independent
claim. As for this claim, Ceasar discloses a sputtering
apparatus for use in an evacuated volume, comprising 1) an ion
source (14) with a device (28) for introducing into the ion
source a gas which is ionizable to produce a plasma having a

prior art.

sheath, the ion source being capable of producing ions which leave the ion source in the form of an ion efflux and have an energy of 0 to about 2,000 eV, 2) a sputter target (34) positioned such that an ion efflux from the ion source causes particles to be sputtered from the target (figure 1), and 3) a deposition substrate (40) positioned such that particles sputtered from the target can be deposited thereon (figure 1), wherein ionizable gas within the evacuated volume can be at a pressure which is less by one or two orders of magnitude than the pressure of ionizable gas within the ion source (col. 4, lines 18-38; col. 5, lines 36-62; col. 6, lines 25-48).

Ceasar's sputter target is not disclosed as being biased negative relative to ground. However, King teaches that in the disclosed ion beam sputtering apparatus, a Kaufman-type ion source, which is the type used by Ceasar (col. 5, lines 42-43), can be used as a source of ions "as long as the beam is accelerated from the necessary potential relative to ground (or other target potential) to give the ions the necessary energies, and is properly controlled to be properly intercepted on the target" (col. 5, lines 41-46). Because the ions which are accelerated between the necessary potential and the target potential to give them the desired energy are positively charged,

this teaching would have fairly suggested, to one of ordinary skill in the art, using, as the target potential other than ground potential, a negative potential so that increased acceleration and energy are imparted to the ions. Consequently, King would have fairly suggested, to one of ordinary skill in the art, use of a negative target potential with Ceasar's Kaufman type ion source to obtain this benefit of increased ion acceleration and energy.

The appellants state that one of the present inventors, Harold R. Kaufman, is the inventor of the Kaufman ion source described in the Kaufman patent (brief, page 5). The appellants argue, in reliance upon a declaration by Kaufman (filed February 16, 2001, paper no. 4) and a supplemental declaration by Kaufman (filed May 21, 2001, paper no. 8), that Ceasar's Kaufman type ion source, when operated in the manner described by Ceasar, would not be capable of operating at ion beam energies of 50 eV or less (brief, page 5; reply brief, page 1). The appellants point out that Harper discloses (page 181) operating a Kaufman type ion source at a beam energy of 500-2,000 eV (brief, page 5).

The supplemental Kaufman declaration (page 2) indicates that by "operated in the manner described by Ceasar et al." (declaration, page 2), Kaufman means operated without a negative

bias on the sputter target. Kaufman argues that because it is sometimes necessary to carry out an ion beam process such as ion beam implanting at an elevated potential, King's parenthetical statement, "or other target potential", is not an explicit teaching of a negative bias (declaration, pages 3-4). It is not clear whether the ion beam implanting referred to by Kaufman is the implantation of sputtered ions disclosed by King (abstract). Regardless, even if there are ion beam processes that can be carried out using a positive biased sputter target, King would have fairly suggested, to one of ordinary skill in the art, using a negative biased sputter target in Ceasar's apparatus to obtain increased ion acceleration and energy as discussed above.

The ion beam energy range disclosed by King as being useful with the target having ground or other potential is 0.5-50 keV (500-50,000 eV), which is higher than the upper limit of about 50 eV recited in the appellants' claim 1. However, the relevant issue regarding the appellants' apparatus claims is not whether the applied prior art would have fairly suggested, to one of ordinary skill in the art, operation of a sputtering apparatus at an ion beam energy of about 50 eV or less but, rather, whether the applied prior art would have fairly suggested, to one of ordinary skill in the art, a sputtering apparatus which is

capable of being operated at an ion beam energy of about 50 eV or less. As discussed above, the record indicates that Ceasar's sputtering apparatus, modified to have a negative biased sputter target as suggested by King, would have that capability.

Accordingly, we affirm the rejection of claim 1.

The appellants' sole argument regarding the dependent claims, including claims to which additional references are applied, is that the applied prior art does not remedy the deficiency alleged by the appellants in Ceasar and King regarding claim 1 from which these claims depend (brief, pages 8-9). Because, as discussed above, we do not consider the alleged deficiency in Ceasar and King to exist as to claim 1, we affirm the rejection of dependent claims 2-7.

Claim 8

The appellants' method claim 8 requires providing ions in the form of an ion efflux having an energy of about 50 eV or less.

The examiner argues that the Kaufman patent teaches that the voltage used to accelerate the ions can be "one to several thousand volts" (col. 4, line 21), which the examiner interprets as meaning one volt to several thousand volts (answer, page 7). Kaufman explains that what is meant is that the voltage can be

one thousand to several thousand volts (supplemental declaration, page 2). The examiner does not find Kaufman's interpretation convincing in view of Ceasar's disclosure of using a Kaufman type ion source to produce an ion beam having an energy of 0-2,000 eV (answer, page 7). Kaufman's interpretation of "one to several thousand volts" as meaning one thousand to several thousand volts is entitled to significant weight since it is his own disclosure, and the examiner has provided no evidence or reasoning which shows that Kaufman's interpretation, which is a reasonable interpretation, is incorrect. Moreover, as discussed above, Kaufman indicates in his declaration (pages 2-3) and supplemental declaration (page 2) that sputtering using the ion source he invented and Ceasar uses is impossible at an ion beam energy at or below about 50 eV unless the target has a negative bias, and the examiner has provided no evidence or reasoning to the contrary.

The examiner argues that because Ceasar is presumed to be valid, Ceasar can be presumed to be operative throughout the entire disclosed 0-2,000 eV ion beam energy range (answer, page 5). Under 35 U.S.C. § 282, each claim of a patent is presumed to be valid. The examiner's argument is not well taken because none of Ceasar's claims requires an ion beam energy of

about 50 eV or less. Moreover, Kaufman indicates in his declaration (pages 2-3) and supplemental declaration (page 2) that sputtering using the ion source he invented and Ceasar uses is impossible at an ion beam energy at or below about 50 eV unless the target has a negative bias, and the examiner has provided no evidence or reasoning to the contrary.

Nor has the examiner explained why King's teaching of using a target potential other than ground in combination with an ion beam energy of 500-50,000 eV (col. 5, lines 31-46) would have fairly suggested, to one of ordinary skill in the art, operation at an ion beam energy of about 50 eV or less. The examiner argues that King discloses 20-30 eV as the threshold level for the onset of sputtering to occur (answer, pages 5 and 7). As pointed out by Kaufman (declaration, page 4), this energy range refers to the ions striking the substrate, not the target (col. 4, lines 58-60).

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For the above reasons we reverse the rejection of claim 8.

DECISION

The rejections under 35 U.S.C. § 103 of claims 1 and 5 over Ceasar in view of King, claim 2 over Ceasar in view of King and Quazi, claims 3 and 4 over Ceasar in view of King and Arnold, claim 3 over Ceasar in view of King, Quazi and Arnold, and claims 6 and 7 over Ceasar in view of King, Quazi and Ion Beam Neutralization, are affirmed. The rejection under 35 U.S.C. § 103 of claim 8 over Ceasar in view of King is reversed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED-IN-PART

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EDWARD C. KIMLIN)	
Administrative Patent Judge)	
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CHUNG K. PAK)	
Administrative Patent Judge)	APPEALS AND
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TERRY J. OWENS)	
Administrative Patent Judge)	

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Dean P. Edmundson
P.O. Box 179
Burton, TX 77835

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